IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Michael Ben Sellers
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Group Art Unit:	3768
Examiner:	Ellsworth Weatherby
Confirmation No.	1906
For:	GRADIENT COIL APPARATUS AND METHOD OF ASSEMBLY THEREOF

REPLY BRIEF

This Reply Brief is submitted in response to the Examiner's Answer dated November 16, 2009.

1. THE REAL PARTY IN INTEREST

The real party in interest in this appeal is General Electric Company. Ownership by General Electric Company is established by an assignment document recorded for this application on January 8, 2009 on Reel 022074 and Frame 0226.

2. STATUS OF CLAIMS

Claims 1-3, 5-7, 12-18 and 21-24 are pending and are the claims subject to this appeal. Claims 4, 8-11, 19, 20 have been cancelled.

Claims 1-3, 12-15, 17 and 21, 22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 7,190,170.

Claims 1, 2, 6, 7, 12-15, 17, 18, 21, 22 and 24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Dietz et al. (U.S. Patent No. 6,642,717) in view of Wang et al. (U.S. Patent Publication No. 2004/0225213).

Claim 3 is rejected under 35 U.S.C. §103(a) as being unpatentable over Dietz et al. (U.S. Patent No. 6,642,717) in view of Wang et al. (U.S. Patent Publication No. 2004/0225213) as applied to claim 1, and further in view of Doty (U.S. Patent No. 5,530,355).

Claims 5 and 23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Dietz et al. (U.S. Patent No. 6,642,717) in view of Wang et al. (U.S. Patent Publication No. 2004/0225213) as applied to claims 2 and 22, and further in view of Lehne et al. (U.S. Patent No. 5,235,283).

3. ARGUMENT

A.1

In the Examiner's Answer, the Examiner asserted that Dietz et al. and Wang et al. address the same problem, the generation of heat thru electrical conduction, by using a coating which controls thermal and electrical conduction. See Examiner's Answer, page 7, lines 7-9. Applicant respectfully disagrees with this broad assertion. Referring to Figure 1, Dietz et al. discloses an internal damping structure 34 that has a high thermal conductivity to conduct heat generated in the gradient coils 12, 14 away from the gradient coils. See Dietz et al., column 2, lines 2-24. In contrast, Wang et al. discloses a sensor that has a coating of nanomagnetic particles on an exterior of the sensor that deflect electromagnetic fields while remaining electrically non-conductive. See Wang et al., paragraph 0164. Accordingly, both Dietz et al. and Wang et al. are directed to solving two different problems: (i) Dietz et al. dissipating heat generated by gradient coils away from the gradient coils, and (ii) Wang et al. shielding the sensor from electromagnetic fields thus preventing eddy currents in the sensor. Accordingly, applicant submits that one skilled in the art would have no motivation to combine the teachings of Dietz et al. and Wang et al. when neither reference is directed to solving the same problem.

Further, Dietz et al. and Wang et al. do not recognize the problem of undesirable electrostatic discharges in air bubbles within a gradient coil assembly that is addressed by the claimed invention.

In the Examiner's Answer, the Examiner further argues that Wang et al. teaches that it is known to limit the conductivity using lower concentrations of particles or to vary the concentration of particles to optimize the sensor performance. See Examiner' Answer, page 6, 16-19. Applicant respectfully disagrees with this broad assertion. In contrast, applicant submits that Wang et al. discloses a sensor that has a coating of nanomagnetic particles on an exterior of the sensor that deflects electromagnetic fields while remaining *electrically non-conductive*. See Wang et al., paragraph 0164. In other words, Wang et al. discloses that it *eliminates eddy currents*, instead of merely limiting the conductivity (e.g., limiting the current to a low current level) as suggested by the Examiner.

Further, the Examiner argues that Dietz et al. utilizes a conductive compound in an MRI gradient coil assembly to achieve a certain degree of conductivity. See Examiner's Answer, page 6, lines 11-13. In contrast, the Wang et al. discloses utilizing the coating of nanomagnetic particles to eliminate the eddy currents in the current sensor. Accordingly, Wang et al. actually teaches away from a structure allowing a low current level, as suggested by the Examiner.

Because no proper motivation has been identified for the proposed combination of Dietz et al. and Wang et al., applicant submits that the rejection of claims 1, 2, 6, 7, 12-15, 17, 18, 21, 22, and 24 based on the proposed combination under 35 U.S.C. §103(a) is improper.

A.2 - Claim 1

For purposes of understanding and for responding to the Examiner's assertions, applicant will provide a brief explanation of the problem being solved by the claimed invention. In an MRI machine, a gap is formed between first and second gradient coils in an MRI machine and the gap is filled with a resin. Further, air bubbles may be trapped within the resin. During energization of the first and second gradient coils, a voltage potential may be induced in each air bubble contained in the resin. When the voltage potential reaches a threshold voltage, an electrostatic discharge may generate undesirable burst of electromagnetic radiation and create a "snowy image" in the MRI machine.

In order to solve the foregoing problem, applicant has recognized that a conductive compound having a plurality of conductive particles at a specific volume range of the conductive compound will allow a small current (e.g., less than 10 microamps) to flow through the compound to reduce electrostatic discharges.

Referring to claim 1, the claim recites: "a volume percentage of the plurality of conductive particles is 0.1% or less of a volume of the conductive compound such that a current flowing through the conductive compound is limited to less than 10 microamps to reduce electrostatic discharges in the glue. From the above explanation, it will be understood that in claim 1, a volume percentage of conductive particles is 0.1% or less of a volume of the conductive compound. However, the volume percentage of conductive

particles cannot be equal to a zero volume percentage, as suggested by the Examiner, since no current would flow through the glue if a zero volume percentage of conductive particles were present in the glue, and such an interpretation would be contrary to the claim language "current flowing through the conductive compound." Further, the current flowing through the conductive compound is limited to less than 10 microamps but cannot be zero microamps, as suggested by the Examiner, since no reduction in electrostatic discharge would occur if zero microamps were present since the voltage potential in air bubbles in the conductive compound would not be reduced, and such an interpretation would be contrary to the claim language "to reduce electrostatic discharges in the glue."

Further, applicant submits that Wang et al. does not teach or suggest: "*a volume percentage of the plurality of conductive particles is 0.1% or less of a volume of the conductive compound* such that a current flowing through the conductive compound is limited to less than 10 microamps to reduce electrostatic discharges in the glue", as recited in claim 1. In contrast, Wang et al. merely discusses a "flexible member having ferromagnetic particles embedded therein a concentration of about 0.001% to about 10% by *weight* of the material..." See Wang et al., paragraph [0010]. In particular, applicant notes that the term "volume" in claim 1 is not equivalent to "weight" of Wang et al., as suggested by the Examiner.

Because Dietz et al. and Wang et al., alone or in combination, do not teach or suggest each and every limitation of claim 1, and claims 2, 6 and 7 which depend on claim 1, applicant submits that the rejection of claims 1, 2, 6 and 7 based on Dietz et al. and Wang et al. under 35 U.S.C. §103(a) is improper.

Applicant further notes that the specification recites: "The volume percentage of conductive particles to resin plus hardener is preferably 0.1% or less of conductive particle volume to 99.0% or greater of resin plus hardener volume. The conductive compound layers 30, 32 preferably limit a currently flowing through layers 30, 32 to less than 10 microamps." See specification, paragraph [0020]. Applicant submits that one skilled in the art after reading paragraph [0020] would recognize that in one exemplary embodiment, a volume percentage of the plurality of conductive particles being 0.1% or less of a volume

of the conductive compound would result in a current flowing through the conductive compound limited to less than 10 microamps, as recited in claim 1. Accordingly, applicant submits that the Examiner's criticality argument regarding the volume percentage of the conductive particles to the limit of current to less than 10 microamps does not appear to be relevant. See Examiner's Answer, page 10, lines 10-15.

A.3 - Claim 12

Independent claim 12 recites in part: "the potting compound layer having a plurality of conductive particles configured to limit a current flowing through the potting compound layer to less than a predetermined current value to reduce electrostatic discharges in the potting compound layer, the plurality of conductive particles being at least one of silver particles and gold particles."

In an attempt to obtain the potting compound layer of claim 12, the Examiner cited paragraph [0242] of Wang et al.. See Examiner's Answer, page 11, lines 10-12. However, paragraph [0242] merely describes aromatic polyesters. However, there is simply no teaching in Wang et al. or Dietz et al. that aromatic polyesters would work as a potting compound between first and second gradient coils as recited in claim 12. Accordingly, applicant submits that Dietz et al. and Wang et al. do not teach or suggest utilizing silver and gold conductive particles in a *potting compound layer* to limit a current flowing through the compound layer to less than a predetermined current value to reduce electrostatic discharges, as recited in claim 12.

Because Dietz et al. and Wang et al., alone or in combination do not teach or suggest each and every limitation of claim 12, applicant submits that the rejection of claim 12 based on Dietz et al. and Wang et al. under 35 U.S.C. §103(a) is improper.

A.4 - Claim 21

Independent claim 21 recites in part: "a volume percentage of the plurality of conductive particles being within a predetermined volume percentage range of the conductive compound such that a current flowing through the conductive compound to less than 10 microamps to reduce electrostatic discharges in the glue."

In the Examiner's Answer, the Examiner asserts that it appears that a volume percentage within the range of 0% to 100% would fall within the predetermined volume percentage range of claim 21. Applicant respectfully disagrees. In particular, the volume percentage of conductive particles cannot be equal to a zero volume percentage in claim 12, since no current would flow through the glue if a zero volume percentage of conductive particles were present in the glue, and such an interpretation would be contrary to the claim language "current flowing through the conductive compound." Further, the current flowing through the conductive compound is limited to less than 10 microamps but cannot be zero microamps, as suggested by the Examiner, because no reduction in electrostatic discharge would occur if zero microamps were present since the voltage potential in air bubbles in the conductive compound would not be reduced, and such an interpretation would be contrary to the claim language "to reduce electrostatic discharges in the glue."

Accordingly, applicant submits that Dietz et al. and Wang et al., alone or in combination, do not teach or suggest: "a volume percentage of the plurality of conductive particles being within a predetermined volume percentage range of the conductive compound such that a current flowing through the conductive compound to less than 10 microamps to reduce electrostatic discharges in the glue", as recited in claim 21.

Further, applicant submits that one skilled in the art will recognize that the volume percentage of conductive particles in a conductive compound comprising a glue and the conductive particles, will affect a current level flowing through the compound. Accordingly, the Examiner's criticality argument regarding the volume percentage of the conductive particles to limit a current to less than 10 microamps, does not appear to be relevant. See Examiner's Answer, page 13, lines 1-3.

Because Dietz et al. and Wang et al., alone or in combination, do not teach or suggest each and every limitation of claim 21, and claims 22 and 24 which depend on claim 21, applicant submits that the rejection of claims 21, 22, and 24 based on Dietz et al. and Wang et al. under 35 U.S.C. §103(a) is improper.

B.1 - Claim 3

Dependent claim 3 recites: "The gradient coil assembly of claim 1 wherein the conductive particles comprise carbon particles." In the Examiner's Answer, the Examiner argued that the motivation to modify Dietz et al. in view of Wang et al. and Doty would have been to aid in casting or curing of the MRI assembly or to achieve a desirable material property. See Examiner's Answer, page 14, lines 9-11.

As discussed above, both Dietz et al. and Wang et al. are directed to solving two different problems: (i) Dietz et al. dissipating heat generated by gradient coils away from the gradient coils, and (ii) Wang et al. shielding the sensor from electromagnetic fields thus preventing eddy currents in the sensor. Accordingly, applicant submits that one skilled in the art would have no motivation to combine the teachings of Dietz et al. and Wang et al. when neither reference is directed to solving the same problem. Adding the teachings of Doty does not remedy the lack of motivation to combine Dietz et al. and Wang et al..

Further, Dietz et al., Wang et al., and Doty do not recognize the problem of undesirable electrostatic discharges in air bubbles within a gradient coil assembly that is addressed by the claimed invention.

Because no proper motivation has been identified for the proposed combination of Dietz et al., Wang et al., and Doty, applicant submits that the rejection of claim 3 based on the proposed combination under 35 U.S.C. §103(a) is improper.

B.2 - Claims 5 and 23

Dependent claim 5 recites: "The gradient coil assembly of claim 2 wherein the epoxy resin comprises a bisphenol-A resin." Claim 23 recites similar limitations as claim 5.

As discussed above, both Dietz et al. and Wang et al. are directed to solving two different problems: (i) Dietz et al. dissipating heat generated by gradient coils away from the gradient coils, and (ii) Wang et al. shielding the sensor from electromagnetic fields thus preventing eddy currents in the sensor. Accordingly, applicant submits that one skilled in the art would have no motivation to combine the teachings of Dietz et al. and Wang et al. when neither reference is directed to solving the same problem. Adding the teachings of Lehne et al. does not remedy the lack of motivation to combine Dietz et al. and Wang et al.

Further, Dietz et al., Wang et al., and Lehne et al. do not recognize the problem of undesirable electrostatic discharges in air bubbles within a gradient coil assembly that is addressed by the claimed invention.

Because no proper motivation has been identified for the proposed combination of Dietz et al., Wang et al., and Lehne et al., applicant submits that the rejection of claims 5 and 23 based on the proposed combination under 35 U.S.C. §103(a) is improper.

Further, claim 5 depends from claim 1 and therefore incorporates all of the limitations of claim 1 therein. Applicant submits that Dietz et al., Wang et al., and Lehne et al., alone or in combination, do not teach or suggest: "a volume percentage of the plurality of conductive particles is 0.1% or less of a volume of the conductive compound such that a current flowing through the conductive compound is limited to less than 10 microamps to reduce electrostatic discharges in the glue", as recited in claim 1.

Further, claim 23 depends from claim 21 and therefore incorporates all of the limitations of claim 21 therein. Applicant submits that Dietz et al., Wang et al., and Lehne et al., alone or in combination, do not teach or suggest: "a volume percentage of the plurality of conductive particles being within a predetermined volume percentage range of

the conductive compound such that a current flowing through the conductive compound is limited to less than 10 microamps to reduce electrostatic discharges in the glue."

Because Dietz et al., Wang et al., and Lehne et al., alone or in combination, do not teach or suggest each and every limitation of claims 1 and 21, and claims 5 and 23 that depend from claims 1 and 21, applicant submits that the rejection of claims 5 and 23 based on Dietz et al., Wang et al., and Lehne et al. is improper.

C. CONCLUSION

In view of the foregoing arguments, applicant respectfully submits that the pending claims are novel and non-obvious. Further, a reversal of the rejections of record, or such recommendation or relief as equity may require, is respectfully requested. Please charge any costs incurred in the filing of this Reply Brief, along with any other costs, to Deposit Account No. 07-0845.

Respectfully Submitted,

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